

## **Regulation No. 44: Control of Distributed Generation Emissions**

### **1.0 General.**

**1.1 Purpose.** The purpose of this regulation is to ensure that emissions of nitrogen oxides (NO<sub>x</sub>), nonmethane hydrocarbons (NMHC), particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), and carbon dioxide (CO<sub>2</sub>) from distributed generation units (*i.e.*, generators) in the State of Delaware do not adversely impact public health, safety, and welfare.

**1.2 Applicability.** This regulation applies to each new and existing stationary generator, except for:

**1.2.1** a generator covered by a permit which imposes a NO<sub>x</sub> emission limitation established to meet Best Available Control Technology (BACT) or Lowest Achievable Emission Rate (LAER), or

**1.2.2** an emergency generator located on a residential property where no commercial or industrial activity is carried on, and operated solely to provide emergency electric power only to the domestic residence on that property housing no more than three (3) families.

### **1.3 Dates.**

**1.3.1** The owner of a new stationary generator shall comply with the requirements of this regulation by the date of installation.

**1.3.2** The owner of an existing stationary generator shall submit to the Department a letter stating whether the generator is to be classified as an emergency generator or a distributed generator, no later than **[insert date 3 months after the effective date]**.

**1.3.2.1** If the generator is to be classified as an emergency generator, the owner shall comply with the requirements of this regulation by **[insert date 3 months after the effective date]**.

**1.3.2.2** If the generator is to be classified as a distributed generator, the owner shall comply with the requirement of this regulation by **[insert date 9 months after the effective date]**.

**2.0 Definitions.** The following words and terms, when used in this regulation, shall have the following meanings:

“*Biodiesel*” means a domestic, renewable fuel for diesel engines derived from natural oils like soybean oil, and which meets the specifications of ASTM D 6751-03a, “Standard Specification for Biodiesel Fuel (B100) Blend Stock for Distillate Fuels,” ASTM International, hereby incorporated by reference.

“*Biodiesel Blend*” means a blend of biodiesel and diesel fuel, designated BXX, where XX represents the volume percentage of biodiesel fuel in the blend. Pure biodiesel is designated as B100.

“*Combined heat and power*” and “*CHP*” means a generator that sequentially produces both electric power and thermal energy from a single source, where the thermal energy is wholly or partly used for either industrial processes or other heating or cooling purposes.

“*Department*” means Department of Natural Resources and Environmental Control as defined in Title 29, Delaware Code, Chapter 80, as amended.

“*Design system efficiency*” means for CHP, the sum of the full load design thermal output and electric output divided by the heat input.

“*Diesel fuel*” means any fuel sold in any state or Territory of the United States and suitable for use in diesel motor vehicles, diesel motor vehicle engines, or diesel nonroad engines, and which is commonly or commercially known or sold as diesel fuel.

“*Digester gas*” means gas generated by the anaerobic digestion of organic wastes such as livestock manure or food processing waste.

“*Distributed generation*” means the implementation of various power generating resources at times other than during an emergency, during testing, or for maintenance purposes; for purposes which include, but are not limited to, peak shaving, interruptible service program operation, behind-the-meter generation, or demand response generation.

“*Distributed generator*” means a stationary generator that is used during an emergency, during testing, and for maintenance purposes, as well as any other purpose.

“*Emergency*” means an electric power outage due to: a failure of the electrical grid; on-site disaster; local equipment failure; or public service emergencies such as flood, fire, or natural disaster.

“*Emergency generator*” means a stationary generator used only during an emergency, during testing, and for maintenance purposes. An emergency generator may not be operated in conjunction with a voluntary demand-reduction program or any other interruptible power supply arrangement with a utility, other market participant, or system operator (e.g., Conectiv, Delaware Electric Cooperative, PJM, etc.).

“*Existing*” means a generator which is not new.

“*Gaseous fuel*” means a fuel which is neither solid nor liquid, and includes but is not limited to natural gas, propane, landfill gas, waste gas, and anaerobic digester gas.

“*Generator*” means an internal combustion engine and associated equipment that converts primary fuel (including fossil fuels and renewable fuels) into electricity, or electricity and thermal energy.

“*Landfill gas*” means gas generated by the decomposition of organic waste deposited in a landfill (including municipal solid waste landfills) or derived from the evolution of organic compounds in the waste.

“*Maintenance*” means the recurrent, periodic, or scheduled work necessary to repair, prevent damage, or sustain existing components of a generator or any ancillary equipment associated with its use.

“*New*” means a generator which:

- a. is installed on or after [insert effective date],
- b. is reconstructed on or after [insert effective date], or
- c. began operating in conjunction with a voluntary demand-reduction program or any other interruptible power supply arrangement with a utility, other market participant, or system operator (e.g., Conectiv, Delaware Electric Cooperative, PJM, etc.) on or after September 1, 2003.

“*Owner*” means the owner of, or person responsible for, a generator.

“*Power to heat ratio*” means for a CHP unit, the design electrical output divided by the design recovered thermal output in consistent units.

“*Prime power rating*” means the maximum amount of power generation a generator is capable of supplying during continuous duty, as specified by the manufacturer.

“*Reconstructed*” means the replacement of components of a generator to such an extent that

- a. the fixed capital cost of the new components exceeds 50% of the fixed capital cost that would be required to purchase and install a comparable new generator; and
- b. it is technologically and economically feasible to meet the applicable standards in this regulation.

“*Stationary*” means an internal-combustion engine which is not propelled or intended to be propelled while performing its function, that is used either in a fixed application, or in a portable (or transportable) application in which the engine will stay at a single property (which includes the land, the buildings, and all improvements thereon) for more than 12 consecutive months.

“*Supplier*” means a person or firm that manufactures, assembles, or otherwise supplies generators.

“*Testing*” means determining the capability of a generator to meet the specified requirements of this regulation or determining if the generator and any ancillary equipment associated with its use are functioning correctly.

“*US EPA*” means the United States Environmental Protection Agency.

“*Waste gas*” means manufacturing or mining byproduct gases that are not used and are otherwise flared or incinerated. A manufacturing or mining byproduct is a material that is not one of the primary products of a particular manufacturing or mining operation, is a secondary and incidental product of the particular operation, and would not be solely and separately manufactured or mined by the particular manufacturing or mining operation. The term does not include an intermediate manufacturing or mining product which results from one of the steps in a manufacturing or mining process and is typically processed through the next step of the process within a short time.

**3.0 Emissions.** A generator shall not exceed the following standards (in pounds per megawatt-hour (lbs/MWh) of electricity output).

**3.1** Emergency generator.

**3.1.1** Existing emergency generator. The owner or operator of an existing emergency generator shall operate the generator in conformance with the manufacturer’s instructions and good air pollution control practices.

**3.1.2** New emergency generator. A new emergency generator shall meet the applicable emissions standards set by the US EPA for non-road engines (40 CFR 89, 90, 91, 92, 94, or 1048 July 1, 2004 Edition) or for stationary gas turbines (40 CFR Part 60, Subpart GG, July 1, 2004 Edition) at the time of installation. A microturbine installed as a new emergency generator must be a microturbine which has received verification under the US EPA’s Environmental Technology Verification program.

**3.2** Distributed generator.

**3.2.1** Existing distributed generator.

**3.2.1.1** Except as provided for in Section 3.2.1.2 of this regulation, an existing distributed generator shall meet the following emission standards:

<b>Pollutant</b>	<b>Emission Standard In lbs/MWh</b>
Nitrogen Oxides:	4.0
Nonmethane Hydrocarbons	1.9
Particulate Matter	0.7
Carbon Monoxide	10.0
Carbon Dioxide:	1,900

**3.2.1.2** As an alternative to the owner, an existing distributed generator which meets all of the following requirements shall be exempt from the emission standards of 3.2.1.1:

**3.2.1.2.1** The generator is equipped with an emission control strategy approved by the Department;

**3.2.1.2.2** It combusts a gaseous fuel, or a biodiesel blend of B5 or greater;

**3.2.1.2.3** It operated in conjunction with a voluntary demand-reduction program or any other interruptible power supply arrangement with a utility, other market participant, or system operator (e.g., Conectiv, Delaware Electric Cooperative, PJM, etc.) prior to September 1, 2003 and continues to participate to the current day; and

**3.2.1.2.4** It has a prime power rating equal to or less than 300 kW.

**3.2.2** New distributed generator.

**3.2.2.1** Except as provided for in Section 3.2.2.4 of this regulation, a new distributed generator with a prime power rating less than 15 MW shall meet the following emission standards:

<b>Pollutant</b>	<b>Emission Standards in lbs/MWh</b>	
	Installed on or After [Effective Date]	Installed on or After January 1, 2010
Nitrogen Oxides:	0.6	0.3
Nonmethane Hydrocarbons	0.3	0.15
Particulate Matter	0.7	0.07
Carbon Monoxide	10.0	2.0
Carbon Dioxide:	1,900	1,900

**3.2.2.2** Except as provided for in Section 3.2.2.4 of this regulation, a new distributed generator operated on a gaseous fuel with a prime power rating greater than or equal to 15 MW shall meet the following emission standards:

<b>Pollutant</b>	<b>Emission Standards in lbs/MWh</b>
	Installed on or After [Effective Date]
Nitrogen Oxides:	0.08
Nonmethane Hydrocarbons	0.04
Particulate Matter	0.7
Carbon Monoxide	2.0
Carbon Dioxide:	1,900

**3.2.2.3** Except as provided for in Section 3.2.2.4 of this regulation, a new distributed generator operated on a liquid fuel with a prime power rating greater than or equal to 15 MW shall meet the following emission standards:

<b>Pollutant</b>	<b>Emission Standards in lbs/MWh</b>
	Installed on or After [Effective Date]
Nitrogen Oxides:	0.2
Nonmethane Hydrocarbons	0.1
Particulate Matter	0.7
Carbon Monoxide	2.0
Carbon Dioxide:	1,900

**3.2.2.4** A new distributed generator that uses waste, landfill, or digester gases containing less than 1.5 grains hydrogen sulfide per 100 dry standard cubic feet or 30 grains total sulfur compounds per 100 dry standard cubic feet, as fuel, shall be exempt from the emission standards of 3.2.2.1, 3.2.2.2, and 3.2.2.3 and shall meet the following emission standards:

Pollutant	Emission Standards in lbs/MWh	
	Installed on or After [Effective Date]	Installed on or After January 1, 2010
Nitrogen Oxides:	1.5	0.6
Nonmethane Hydrocarbons	0.7	0.3
Particulate Matter	0.7	0.07
Carbon Monoxide	10	2
Carbon Dioxide:	1,900	1,900

- 3.3** By [insert date 4 years after the effective date] the Department shall complete a review of the state of, and expected changes in, technology and emissions rates; as well as a review of generators operating within the State of Delaware, and their emissions. This review shall be used by the Department in considering whether these standards in Sections 3.1 or 3.2 should be amended, or new standards adopted, to ensure the continued improvement of the ambient air quality of the State of Delaware. Any amendment to these standards shall be in accordance with the requirements of 7 Del. Code, Chapter 60 and 29 Del. Code, Chapter 101.

#### **4.0 Operating Requirements**

- 4.1** An existing or new emergency generator may operate for an unlimited amount of hours during an emergency, pursuant to the definition of an emergency generator.
- 4.2** An existing or new emergency generator may operate for an unlimited amount of hours during testing or for maintenance purposes, pursuant to the definition of an emergency generator, except as restricted by Section 4.4.
- 4.3** A new or existing distributed generator may operate at any time.
- 4.4** No emergency or distributed generator may be used during testing or for maintenance purposes before 5:00 PM on a day which has been declared by the Department as an "Ozone Action Day," an "Ozone Advisory Day," or an air quality alert day.

#### **5.0 Fuel Requirements.**

- 5.1** Diesel fuel or a biodiesel blend, combusted in a generator, shall have a sulfur content equal to or less than:
- 5.1.1** 0.05% by weight, before January 1, 2007; and
- 5.1.2** 0.0015% by weight, on and after January 1, 2007.

- 5.2 Gaseous Fuels.** Gaseous fuels combusted in a generator shall contain no more than ten grains total sulfur per 100 dry standard cubic feet, except for waste, landfill, or digester gases which shall contain less than 1.5 grains hydrogen sulfide per 100 dry standard cubic feet or 30 grains total sulfur compounds per 100 dry standard cubic feet.

## **6.0 Record Keeping and Reporting.**

- 6.1 Record-Keeping Requirements.** On the property where the generator is installed, or at such other place that the Department approves in writing, the owner of a generator shall maintain the following records:

- 6.1.1** A non-resettable fuel flow metering device shall be used by the owner to continuously monitor the monthly and yearly amounts of fuel, or fuels, consumed by any generator. Yearly fuel consumption shall be calculated and recorded by the owner each calendar month by recording (for each fuel) the current calendar month's fuel consumption and adding it to those of the previous eleven consecutive months.
- 6.1.2** A non-resettable hour metering device shall be used by the owner to continuously monitor the monthly and yearly operating hours for all generators. Yearly operating hours shall be calculated and recorded by the owner each calendar month by recording the current calendar month's operating hours and adding them to those of the previous eleven consecutive months.
- 6.1.3** Monthly and yearly operating hours for an emergency generator. Yearly operating hours during which testing or maintenance occurred shall be calculated and recorded by the owner each calendar month by recording the current calendar month's testing or maintenance hours and adding them to those of the previous eleven consecutive months. A brief description of each testing or maintenance performed shall also be recorded.
- 6.1.4** Except as provided for in 6.1.5, for each shipment of liquid fuel (other than liquefied petroleum gas), received for use in a generator, a shipping receipt and certification shall be obtained from the fuel supplier which identifies:
- 6.1.4.1** the type of fuel delivered;
- 6.1.4.2** the percentage of sulfur in the fuel (by weight dry basis), and the method used by the fuel supplier to determine the sulfur content; and



**6.1.4.3** the percent by volume of biodiesel if the fuel is a biodiesel blend.

**6.1.5** As an alternative to 6.1.4, the owner may have the fuel in the generator's fuel tank certified by a third party laboratory, after each shipment of liquid fuel, and before subsequent operation of the generator. This certification shall identify:

**6.1.5.1** the type of fuel delivered;

**6.1.5.2** the percentage of sulfur in the fuel (by weight dry basis), and the method used to determine the sulfur content; and

**6.1.5.3** the percent by volume of biodiesel if the fuel is a biodiesel blend.

**6.2 Availability of Records.** The owner shall maintain each record required by Section 6.1 for a minimum of five years after the date the record is made. An owner shall promptly provide the original or a copy of a record or records to the Department upon request.

## **7.0 Emissions Certification, Compliance, and Enforcement.**

**7.1 Emissions Certification by a Supplier.** A supplier may seek to certify that its generators meet the provisions of this regulation.

**7.1.1 Certification Process.** Emissions of nitrogen oxides, nonmethane hydrocarbons, particulate matter, carbon monoxide, and carbon dioxide from the generator shall be certified in pounds of emissions per megawatt hour (lb/MWh) at International Organization for Standardization (ISO) conditions or at the load conditions specified by the applicable testing methods in Section 7.4.1. If the design of a certified generator is modified, the generator will need to be re-certified. Certification means that a generator meets the required emissions standards and can be installed as supplied. With respect to nitrogen oxides, nonmethane hydrocarbons, carbon monoxide, and carbon dioxide, test results from EPA Reference Methods, California Air Resources Board methods, or equivalent testing may be used to verify this certification. When testing the output of particulate matter from liquid-fuel reciprocating engines, ISO Method 8178 shall be used. Test results shall be provided upon request to the Department. An engine that has been certified to meet the currently applicable US EPA non-road emissions standards shall be deemed to be certified for use in new emergency generators. A statement attesting to certification shall be displayed on the nameplate of the unit or on a label attached to the unit with the following text:

This engine has met the standards defined by the State of Delaware's Regulation No. 44 and is certified as meeting applicable emission levels when it is maintained and operated in accordance with the supplier's instructions.

**7.1.2 Responsibility of Supplier.** Certification will apply to a specific make and model of generator. For a make and model of a generator to be certified, the supplier shall certify that the generator is capable of meeting the requirements of this regulation for the lesser of 15,000 hours of operation or three years.

**7.2 Emissions Certification by an Owner.** An owner shall certify that a generator complies with the emission requirements of Section 3.0 by submitting the following data to the Department for review:

**7.2.1** a description of the generator including the make, model number, and serial number;

**7.2.2** the year of manufacture for the generator;

**7.2.3** the prime power rating for the generator;

**7.2.4** the type or a description of any emission control equipment used; and

**7.2.5** emissions test data for the generator, supporting documentation for any emission control equipment used, supporting calculations, quality control/assurance information, and all other information needed to demonstrate compliance with the requirements.

**7.3 Recertification.** To ensure continuing compliance with the emissions limitations, the owner or operator shall re-certify a unit every 20,000 hours of operation, but no less frequently than every five years. Re-certification may be accomplished by following a maintenance schedule that the manufacturer certifies will ensure continued compliance with the required standards, or by third party testing of the generator using appropriate test methods to demonstrate that the generator still meets the required emission standards.

**7.4 Testing.**

**7.4.1 Emissions.** Compliance with this regulation shall be demonstrated through testing using the applicable EPA Reference Methods, California Air Resources Board methods, or equivalent test methods approved by the Department if:

**7.4.1.1** a supplier is seeking to certify that one of its generators meets the provisions of this regulation, pursuant to Section 7.1;

**7.4.1.2** an owner owns a generator that is not certified under the terms of Section 3.1.2, Section 7.1, or Section 7.2; or

**7.4.1.3** an owner of a generator is seeking to recertify the generator via third party testing pursuant to Section 7.3.

**7.4.2 Sulfur Content.** Sulfur limits pursuant to Section 5.1 shall be determined using the applicable sampling and testing methodologies set forth in 40 CFR 80.580 (July 1, 2004).

**7.5 Duty to Comply.** An owner shall comply with the requirements of this regulation. Neither certification nor compliance with this regulation relieves owners from compliance with all other applicable state and federal regulations.

**7.6 Enforceability.** This regulation is enforceable by the Department as provided by law.

## **8.0 Credit for Concurrent Emissions Reductions.**

**8.1 Flared Fuels.** If a generator uses fuel that would otherwise be flared (*i.e.*, not used for generation or other energy related purpose), the emissions that were or would have been produced through the flaring can be deducted from the actual emissions of the generator, for the purposes of calculating compliance with the requirements of this regulation. If the actual emissions from flaring can be documented, they may be used as the basis for calculating the credit, subject to the approval of the Department. If the actual emissions from flaring cannot be documented, then the following default values shall be used:

<b>Emissions</b>	<b>Waste, Landfill, Digester Gases</b>
Nitrogen Oxides	0.1 lbs/MMBtu
Particulate Matter	N/A
Carbon Monoxide	0.7 lb/MMBtu
Carbon Dioxide	117 lb/MMBtu

## **8.2 Combined Heat and Power.**

**8.2.1** CHP installations shall meet the following requirements to be eligible for emissions credits related to thermal output:

**8.2.1.1** At least 20% of the fuel's total recovered energy shall be thermal and at least 13% shall be electric. This corresponds to an allowed

power-to-heat ratio range of between 4.0 and 0.15.

**8.2.1.2** The design system efficiency shall be at least 55%.

**8.2.2** A CHP system that meets the requirements of 8.2.1 may receive a compliance credit against its actual emissions based on the emissions that would have been created by a conventional separate system used to generate the same thermal output. The credit shall be subtracted from the actual generator emissions for purposes of calculating compliance with the limits in Sections 3.1 or 3.2. The credit will be calculated according to the following assumptions and procedures:

**8.2.2.1** The emission rates for CHP facilities that replace existing thermal systems (e.g., boiler) for which historic emission rates can be documented shall be the historic emission rates in lbs/MMBtu, but not more than the emission rates for new facilities that displace a thermal system, which are:

Emissions	Maximum Rate
Nitrogen Oxides	0.2 lbs/MMBtu
Particulate Matter	N/A
Carbon Monoxide	0.08 lbs/MMBtu
Carbon Dioxide	117 lbs/MMBtu

**8.2.2.2** The emissions rate of the thermal system in lbs/MMBtu will be converted to an output-based rate by dividing by the thermal system efficiency. For new systems the efficiency of the avoided thermal system will be assumed to be 80% for boilers or the design efficiency of other process heat systems. If the design efficiency of the other process heat system cannot be documented, an efficiency of 80% will be assumed. For retrofit systems, the historic efficiency of the displaced thermal system can be used if that efficiency can be documented and if the displaced thermal system is either enforceably shut down and replaced by the CHP system, or if its operation is measurably and enforceably reduced by the operation of the CHP system.

**8.2.2.3** The emissions per MMBtu of thermal energy output will be converted to emissions per MWh of thermal energy by multiplying by  $3.413 \text{ MMBtu/MWh}_{\text{thermal}}$ .

**8.2.2.4** The emissions credits in  $\text{lbs/MWh}_{\text{thermal}}$ , as calculated in 8.2.2.3, will be converted to emissions in  $\text{lbs/MWh}_{\text{emissions}}$  by dividing by the CHP system power-to-heat ratio.

**8.2.2.5** The credit, as calculated in 8.2.2.4, will be subtracted from the actual emission rate of the CHP unit to produce the emission rate used for compliance purposes.

**8.2.2.6** The mathematical calculations set out in subsections 8.2.2.1 through 8.2.2.4 above are expressed in the following formula:

$$\text{Credit lbs/MWh}_{\text{emissions}} = [(\text{boiler limit lbs/MMBtu})/(\text{boiler efficiency})] * [3.413/(\text{power to heat ratio})]$$

**8.3 Non-Emitting Resources.** When electricity generation that does not produce any of the emissions regulated herein is installed and operated simultaneously at the facility where the generator is installed and operated, then the electricity savings supplied by the non-emitting electricity source shall be added to the electricity supplied by the generator for the purposes of calculating compliance with the requirements of this regulation, subject to the approval of the Department and in accordance with the following formula for determining such savings:

$$\text{Rate}_{\text{EF}} = (\text{Rate}_{\text{A}}) * [(\text{Size}_{\text{A}})/(\text{Size}_{\text{A}} + \text{Size}_{\text{NER}})]$$

$\text{Rate}_{\text{EF}}$  = effective emission rate of generator, accounting for non-emitting resource(s) (lb/MWh)

$\text{Rate}_{\text{A}}$  = actual emission rate of generator alone (lb/MWh)

$\text{Size}_{\text{A}}$  = actual prime power rating of generator (MW)

$\text{Size}_{\text{NER}}$  = total generating capacity of non-emitting resource(s) (MW)